CLAIMS

What is claimed is:

1. A structure comprising:

a substrate having a surface;

a plurality of elongated electrical conductors extending away from said surface;

each of said elongated electrical conductors having a first end affixed to said surface and a second end projecting away from said surface;

there being a plurality of said second ends;

a means for positioning and maintaining said plurality of said second ends in substantially fixed positions.

2. A structure according to claim 1 wherein said first end is affixed to said surface at an electrical contact location.

3. A structure according to claim 1 wherein said means for positioning and maintaining is a plurality of sheets of material each having a plurality of opening therein through which said second ends project.

4. A structure according to claim 1 wherein at said second end there is disposed a structure selected from the group consisting of a protuberance and a sharp spike.

5. A structure according to claim 3 wherein said plurality of sheets are formed from a material selected from the group consisting of a rigid material and a compliant material.

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6. A structure according to claim 3 wherein each of said sheets comprise a plurality of openings, said elongated electrical conductors are disposed against the sides or said openings of at least two of said sheets.

7. A structure according to claim 3 wherein said sheet is spaced apart from said surface by a flexible support.

8. A structure according to claim 7 wherein said flexible support is selected from the group consisting of a spring and an elastomeric material.

9. A structure according to claim 1 wherein said elongated electrical conductors have a shape selected from the group consisting of linear, piece wise linear, curved and combinations thereof.

10. A structure according to claim 7 wherein said sheet and said flexible support forms a space containing said plurality of elongated electrical conductors.

11. A structure according to claim 10 wherein said space is filled with a flexible material.

12. A structure according to claim 11 wherein said flexible material is an elastomeric material.

13. A structure according to claim 3 wherein at least one of said sheets is a sheet of electrically conductive material which has a top surface and a bottom surface and said openings have a sidewall, a dielectric material coats said top surface and said bottom surface and said sidewall.

14. A structure according to claim 1 wherein said plurality of elongated electrical conductors are distributed into a plurality of groups.

15. A structure according to claim 14 wherein said plurality of groups are arranged in a array.

16. A structure according to claim 1 wherein said structure is a probe for an electronic device.

17. A structure according to claim 16 wherein said electronic device is selected from the group consisting of an integrated circuit chip and a packaging substrate.

18. A structure according to claim 15 wherein each of said groups corresponds to an integrated circuit chip on a substrate containing a plurality of said integrated circuit chips.

19. A structure according to claim 18 wherein said substrate containing said plurality of integrated circuit chips is a wafer of said integrated circuit chips.

20. An apparatus for using said structure of claim 1 to test an electronic device comprising: means for holding said structure of claim 1, means for retractably moving said structure of claim 1 towards and away form said electronic device so that said second ends contact electrical contact locations on said electronic device, and means for applying electrical signals to said elongated electrical conductors.

21. A structure according to claim 4 wherein said protuberance is spherelike.

22. A structure according to 3 wherein said structure is for electrical connection to device and wherein said means for maintaining and positioning comprises a first sheet of material having a temperature coefficient of expansion substantially matched to said electronic device, said first sheet has a first side and a second side, a first sheet of dielectric material disposed on said first side and a second sheet of dielectric material disposed on said second side, d electrically conductive material having a plurality of first through holes therein, and a sheet of a dielectric material having a plurality of second through holes therein, said first through holes are aligned with said second through holes, said first through holes have a smaller diameter than said second through holes to provide a means for preventing said elongated electrical conductors from electrically contacting said sheet of electrically conductive material.

23. A structure according to claim 22 wherein sheet or electrically conductive material has a first side and a second side, said sheet of dielectric material is disposed on either of said first side and said second side of said sheet of electrically conductive material.

24. A structure according to claim 23, where there is disposed on said first side and said second side of said sheet of electrically conductive material a layer of said dielectric material.

25. A structure according to claim 3 wherein said sheet comprises a sheet of rigid material having a plurality of through holes therein, said sheet contains a dielectric material to provide a means for preventing said elongated electrical conductors from electrically contacting said sheet of electrically conductive material.

26. A structure according to claim 3 wherein said sheet comprises a sheet of dielectric material having a plurality of through holes therein, said sheet contains a sheet of a rigid material disposed in contact with said sheet of dielectric material, said sheet of rigid material has on opening therein exposing a plurality or said through holes to provide a means for support of said dielectric material.

27. A structure according to claim 26 wherein said sheet is spaced apart from said surface by a flexible support, said sheet of rigid material is disposed on said flexible support.

28. An apparatus for making electrical contact with a plurality of bond pads on an integrated circuit device comprising: a first fan out substrate having a first surface, said first surface having a plurality of contact locations; a plurality of ball bonds attached to said plurality of contact locations; a plurality of wires extending outward from said ball bonds, away from said first surface on fan out substrate; a plurality of ball shaped contacts on the ends of said plurality of wires; and a means for maintaining said plurality of balls in substantially fixed positions.

29. A high density probe according to claim 28, wherein said fan out substrate is selected from the group consisting of: multilayer ceramic substrates with thick film wiring; multilayer ceramic substrates with thin film wiring; metallized ceramic substrates with thin film wiring; epoxy glass laminate substrates with copper wiring; and silicon substrates with thin film wiring.

30. A high density probe according to claim 28, further including a preformed frame of foamed elastomer material surrounding clusters, groupings, or arrays of said probes.

31. A high density probe according to claim 30, further including a layer of elastomer material surrounding said probes in said cluster.

32. A high density probe according to claim 31, wherein said means for maintaining is a sheet of Invar material that has a thin coating of a polymer material and a plurality of openings corresponding to said plurality of ball shaped contacts.

33. A high density probe according to claim 31, further including a sheet of rigid material with a plurality of large diameter openings corresponding to said plurality of ball shaped contacts.

34. A high density probe according to claim 33, further including a sheet of polymer material with a plurality of small diameter openings corresponding to said plurality of ball shaped contacts place on top of said sheet of Invar material.

35. A high density probe according to claim 37, further including a sheet of polymer material with a plurality of openings corresponding to said plurality of ball shaped contacts.

36. A high density probe according to claim 35, further including a frame of rigid material attached to said sheet of polymer material with said plurality of openings corresponding to said plurality of ball shaped contacts.

37. A high density probe according to claim 32, further including a thick frame of rigid material attached to said sheet of Invar material with said thin coating of a polymer material and said plurality of openings corresponding to said plurality of ball shaped contacts.

38. A high density probe according to claim 33, further including a plurality of probes arrays corresponding to the location of a plurality of IC devices on a wafer.

39. A high density probe according to claim 30, further including a sheet of rigid material that has a thin coating of a polymer material and a plurality of openings corresponding to said plurality of ball shaped contacts.

40. A structure according to claim 1 wherein said substantially fixed positions substantially correspond to electrical contact locations on a device to be tested by said probe.

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41. A method comprising:

providing a substrate having a surface;

forming a plurality of elongated electrical conductors extending away from said surface;

each of said elongated electrical conductors having a first end affixed to said surface and a second end projecting away from said surface;

there being a plurality of said second ends;

providing a means for maintaining said plurality of said second ends in substantially fixed positions with respect to each other.

42. A structure according to claim 3 wherein said sheet is formed and material selected from the group consisting of Invar, Cu/Invar/Cu, molybdenum, polyimides.

43. A structure according to claim 3 wherein said sheet is formed from a material selected from the group consisting of a metal, a polymer, a semiconductor and dielectric.

44. A structure according to claim 43 wherein said dielectric is selected from the group consisting of a ceramic and a glass.

45. A structure according to claim 1 where at least a part of said elongated conductor is coated with a hard coat.

46. A structure according to claim 45 wherein said hard coat is selected from the group consisting of Pd, Pt, Ni, Au, Rh, Ru, Re, Cu, Co alloys thereof and combinations thereof.

47. A structure according to claim 3 wherein at least one of said sheets is a sheet of electrically conductive material having a plurality of through holes therein, said sheet of electrically conductive material material contains a dielectric material to provide a means for preventing said elongated electrical conductors from electrically contacting said sheet of electrically conductive material.